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EXAMINER	
TRUONG, CAM Y T	
ART UNIT	**PAPER NUMBER**
2162	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/898,708	BABKA ET AL.
	Examiner	Art Unit
	Cam Y T. Truong	2162

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-7,12-15, 17-38 and 41* is/are rejected.

7)☒ Claim(s) *3,4,8-11,16,39 and 40* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-41 are pending in this Office Action.

Applicant filed Appeal Brief on 4/11/2005. Applicant's argument has been carefully considered by an appeal conference. Thus, the finality of the office action on 3/23/2004 is withdrawn. The office regrets for any inconvenience to the applicant.

Applicant's arguments with respect to claims 1-41 have been considered but are moot in view of the new ground(s) of rejection.

In view of the Appeal Brief filed on 04/22/2003, PROSECUTION IS HEREBY REOPENED. The rejections are set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. Claims 1-34 are rejected under 35 U.S.C.101 because the language of the claim raises a question as to whether the claim is directed merely to an abstract idea that is not tied to a technological art, environment or machine which would result in a practice application producing a concrete, useful, and tangible result to form the basis of statutory subject matter under 35 U.S.C 101.

As regarding to:

Claim 1 recites "a method of identifying equivalent portions of one or more unsorted hierarchically-organized data structure". However, the method does not define structural and functional interrelationships between the data structure and the computer software and hardware components which permits the method's functionality to be realized. Thus, claim 1 is merely abstract idea whereby "collapsing plural nodes thereof into respective representations that incorporate information of a respective node and that of any child nodes thereof" is being processed without any links to a practical result in the technology arts and without computer manipulation.

Claims 2-17 recite "the method". However, the claimed data structure does not define structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized. Thus, claims 2-10 are merely abstract idea and are being processed without any links to a practical result in the technology arts and without computer manipulation.

Claim 18 recites "a method of identifying equivalent logical sub-trees of a tree-oriented data representation". However, the method does not define structural and

functional interrelationships between the data structure and the computer software and hardware components which permits the method's functionality to be realized. Thus, claim 18 is merely abstract idea and being processed without any links to a practical result in the technology arts and without computer manipulation.

Claims 19-28 recite "the method". However, the claimed data structure does not define structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized. Thus, claims 19-28 are merely abstract idea and are being processed without any links to a practical result in the technology arts and without computer manipulation.

Claim 29 recites "a method of representing hierarchically-organized data". However, the method does not define structural and functional interrelationships between the data structure and the computer software and hardware components which permits the method's functionality to be realized. Thus, claim 29 is merely abstract idea and being processed without any links to a practical result in the technology arts and without computer manipulation.

Claims 30-32 recite "the method". However, the claimed data structure does not define structural and functional interrelationships between the data structure and the computer software and hardware components, which permit the data structure's functionality to be realized. Thus, claims 30-32 are merely abstract idea and are being processed without any links to a practical result in the technology arts and without computer manipulation.

Claim 33-34 recite "a computer program product encoded in at least one computer readable medium". However, the computer program product encoded in a wireless does not define structural and functional interrelationships between a product and the computer software and hardware components, which permits the method's functionality to be realized. Thus, claim 33-34 are merely abstract idea and being processed without any links to a practical result in the technology arts and without computer manipulation.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 2, 5, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aggarwal et al (or hereinafter "Aggarwal") (US 5781906) in view of Jeyaraman (USP 6311187).

As to claim 1, Aggarwal teaches the claimed limitations:

"collapsing plural nodes thereof into respective representations that each incorporate information of a respective node and that of any child nodes thereof" as collapsing nodes A and B to create nodes AB, collapsing nodes AB and C to create node ABC and collapsing nodes D and F to create node DF (fig. 7, col. 8, lines 20-35);

"wherein the collapsing is order-insensitive with respect to information of the respective child nodes" as collapsing nodes A and B to create nodes AB, collapsing nodes AB and C to create node ABC and collapsing nodes D and F to create node DF. The collapsing of these nodes does not following order from left node to right node. Thus, the collapsing of these nodes is order-insensitive (fig. 7, col. 8, lines 20-35).

Aggarwal does not explicitly teach the claimed limitation "based on correspondence of particular instances of the collapsed representations, identifying the respective portions as equivalent". Jeyaraman teaches matching leaf nodes T1 and T2. If two leaf nodes have the same content, then the hash function generates the same identifier. Where the leaf nodes actually contain data and value identifiers. This information shows that the system identifies the respective portions as equivalent by matching nodes (col. 9, lines 35-46; col. 8, lines 20-25).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Jeyaraman's teaching of matching leaf nodes T1 and T2. If two leaf nodes have the same content, then the hash function generates the same identifier. Where the leaf nodes actually contain data and value identifiers to Aggrarwal's system in order to transform an old tree to new tree so that the system can

eliminate the need for a separate time-consuming pass through the data to create updates from different and improve searching nodes on a tree quickly.

As to claim 2, Aggarwal and Jeyaraman discloses the claimed limitation in claim 1, Jeyaraman further teaches the claimed limitation "wherein the collapsed representations include respective aggregations of orthogonally-encoded child node information" as a tree may represent a document consisting of sections, paragraphs and individual sentences containing parsable character data. All nodes in fig. 6A include a name tag, a value, and an associated value identifier. The parent node is split into a first parent node and a second parent node. The first parent node inherits all of the children that are present in new_t and the second parent inherits the remaining children. This information shows that this document is encoded into nodes of tree. Thus, when a parent node is collapsed, the first and second parent nodes include respective aggregations of encoded node children. The first and second parent nodes are presented as the collapsed representation (col. 8, lines 15-25; col. 7, lines 59-65).

It would have been obvious to a person of a skill in the art at the time the invention as made to apply Jeyaraman's teaching of a tree may represent a document consisting of sections, paragraphs and individual sentences containing parsable character data. All nodes in fig. 6A include a name tag, a value, and an associated value identifier. The parent node is split into a first parent node and a second parent node. The first parent node inherits all of the children that are present in new_t and the second parent inherits the remaining children. This information shows that this

document is encoded into nodes of tree to Aggarwal's system to allow users to search/retrieve portions of documents easily.

As to claim 5, Aggarwal teaches the claimed limitation "wherein the order-insensitive collapsing includes an arithmetic sum of orthogonal binary encodings of child node information" as a binary tree is constructed such that the entries in the leaf nodes correspond to multidimensional also called spatial data objects stored on DASD 105. Thus, all non-leaf nodes have branch factors of 2. Let A be an internal node of the binary tree with children B.sub.1 and B.sub.2. A skew factor near 1/2 implies that the tree will be quite well balanced, but may not do as well with respect to some or all of the design objectives. The leaf number N.sub.A of a node A is defined as the total number of data objects in the leaf descendants of that node. The area of an aligned rectangle I is denoted by A(I). The method ensures that the leaf numbers N.sub.B.sbsb.1 and N.sub.B.sbsb.2 of each of these children are each at least p.multidot.N.sub.A. Among all partitions examined which satisfy this leaf number condition, the one chosen minimizes the sum of the areas of the minimum bounding rectangles A(I.sub.B.sbsb.I)+A(I.sub.B.sbsb.I) subject to a predetermined overlap factor constraint (col. 5, lines 50-67).

As to claim 14, Aggarwal teaches the claimed limitation "wherein the hierarchically-organized data structure includes at least three levels of nodes" as (fig. 7);

"further comprising performing the collapsing at successive ones of the levels of the hierarchically-organized data structure" as (fig. 7).

As to claim 15, Aggarwal teaches the claimed limitation "wherein the hierarchically-organized data structure includes a tree-organized data structure" as (fig. 7).

6. Claims 6, 7, 12, 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aggarwal in view of Jeyaraman and further in view of Brown (USP 6539369).

As to claim 6, Jeyaraman discloses the claimed limitation subject matter in claim 1, except the claimed limitation "wherein distinct tables are defined for each level of the hierarchically organized data structure". However, Brown teaches that lookup table 100 includes mapper level_1 112a and 112b. Mapper level_1 112a includes the first 16 of 32 levels of the binary tree. Mapper level_2 112b includes the next 8 levels of the 32-level binary tree (col. 5, lines 30-65).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of mapping tree levels to lookup table levels to Jeyaraman's system in order to allow multiple sparse subtree descriptors to be stored in a subtree entry in a memory.

As to claim 7, Jeyaraman discloses the claimed limitation subject matter in claim 1, except the claimed limitation "wherein a table spans multiple levels of the hierarchically-organized data structure". However, Brown teaches that a lookup table, which allows sparse, subtree descriptiors and dense subtree descriptors to be stored in the same memory (abstract). It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of a lookup table which allows sparse subtree descriptiors and dense subtree descriptors Jeyaraman's system in order to store nodes of tree in same memory.

As to claim 12, Aggarwal discloses the claimed limitation subject matter in claim 1, except the claimed limitation 'wherein the correspondence collapsed representations is based on identity of respective mapped codes". Brown teaches mapped codes and search for a pointer requires the following cache memory accesses: (1) read a 16 bit code word 46; (2) read a 16-bit base address 42; (3) read a 4 bit offset 54 from the map table 32; (4) read a pointer at a pointer index where the pointer index is the sum of the base address 42, the code word offset 46a and the 4-bit offset 54 (col. 10, lines 61-67;col. 7, lines 50-65).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply's Brown's teaching of mapped codes and search for a pointer requires the following cache memory accesses: (1) read a 16 bit code word 46; (2) read a 16-bit base address 42; (3) read a 4 bit offset 54 from the map table 32; (4) read a pointer at a pointer index where the pointer index is the sum of the base address

42, the code word offset 46a and the 4-bit offset 54 to Aggarwal's system in order to allow search/retrieve data without need for a sequential search through the collection of elements.

As to claim 13, Jeyaraman discloses the claimed limitation subject matter in claim 1, except the claimed limitation "wherein the order-insensitive collapsing includes an arithmetic addition of orthogonally-encoded values that index into a store of child node information". However, Brown teaches that search for a pointer requires the following cache memory accesses: (1) read a 16 bit code word 46; (2) read a 16-bit base address 42; (3) read a 4 bit offset 54 from the map table 32; (4) read a pointer at a pointer index where the pointer index is the sum of the base address 42, the code word offset 46a and the 4-bit offset 54.

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of the pointer index is the sum of the base address 42, the code word offset 46a and the 4-bit offset 54 to Jeyaraman's system in order to allow search/retrieve data without need for a sequential search through the collection of elements.

As to claim 17, Aggarwal discloses the claimed limitation subject matter in claim 1, except the claimed limitation "wherein the hierarchically-organized data structure encodes subassembly information as sub-hierarchies thereof and encodes component

parts at least at leaf nodes thereof". Brown teaches tree encodes information (col. 3, lines 30-50).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of tree encodes information on its nodes to Aggarwal's system in order to find a value corresponding to the search key effiencelty during searching/retrieving.

7. Claims 18-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeyaraman in view of Aggarwal and Fenger et al (or hereinafter "Fenger") (US 6751659).

As to claim 18, Jeyaraman teaches the claimed limitations:

"associating a first-level identifier with each of plural leaf nodes at a first-level of the tree" as all nodes in fig. 6A include a name, a value, and an associated value identifier. Node D is root node in the first level of the tree. Thus, node D identifier is a first-level identifier with each of plural leaf nodes below (col. 8, lines 30-35), "wherein distinct leaf node values are associated with distinct first identifiers" as generating a unique identifier for each of the leaf nodes in T2 based on the content of the leaf node. This can be accomplished by using a hash function to generate a unique identifier for each of the leaf nodes. If two leaf nodes have the same content, then the hash function generates the same identifier. This information means that if two leaf nodes have different value, the system assigns different identifiers to them. Thus, different leaf

node content are associated with different identifiers (col. 9, lines 40-48) "and equivalent leaf node values are associated with same first identifiers" as (col. 9, lines 40-48);

"each next level of the tree, associating an identifier with each node thereof" as (fig. 6A, col. 8, lines 30-35), "each such identifier including a current node contribution and a contribution associated with any child nodes thereof" as all nodes in fig. 6A include a name, a value, and an associated value identifier. The parent node Se on the left side of the tree has an identifier. This parent node includes a current node contribution such as node P on the left side of the tree. This node P associated with child nodes. Thus, the identifier of the left Se has to include P node and all children nodes of P. Similarly, the identifier of the right Se has to include mild P node and all children nodes of mild P (fig. 6A, col. 8, lines 30-35), "wherein the child nodes contribution is computed using a combining function operative on identifiers associated with the child nodes" as the system generates a node collapse operation to bring all the children together in new_t (new tree). Since all nodes include a name, a value, an associated value identifier, thus, when bringing all nodes together, the system has to bring all nodes identifiers too (col. 65-67; col. 8, lines 20-25);

"and wherein for a second level of the tree, respective child nodes are the leaf nodes of the first-level of the tree" as (fig. 6A).

Jeyaraman does not clearly teach the claimed limitation "wherein the identifiers and combining function are selected to ensure that same combinations of child node identifiers result in same child nodes contributions irrespective of ordering of the child node identifiers". Fenger teaches plurality of interior nodes, and a root node said

nodes being initialized in combination with entry of said data record identifiers into said sort tree so as to add nodes to the sort tree as data records are added (col. 12, lines 1-5).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Fenger's teaching of plurality of interior nodes, and a root node said nodes being initialized in combination with entry of said data record identifiers into said sort tree so as to add nodes to the sort tree as data records are added in order to save memory space, eliminate redundant node, and to transform a old tree to new tree efficiently..

As to claim 19, Jeyaraman teaches the claimed limitation "wherein the identifiers are orthogonally-encoded mappings of respective string encodings of the current node contribution concatenated with respective orthogonally-encoded mappings of child node information" as (col. 11, lines 15-45).

As to claim 20, Jeyaraman discloses the claimed limitation in claim 18, except he claimed limitation "wherein the orthogonally-encoded mappings at each level of the tree-oriented data representation are in accordance with a corresponding level-specific table". However, Brown teaches that lookup table 100 includes mapper level_1 112a and 112b. Mapper level_1 112a includes the first 16 of 32 levels of the binary tree. Mapper level_2 112b includes the next 8 levels of the 32-level binary tree (col. 5, lines 30-65).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of mapping tree levels to lookup table levels to Jeyaraman's system in order to allow multiple sparse subtree descriptors to be stored in a subtree entry in a memory.

As to claim 21, Jeyaraman discloses the claimed limitation in claim 18, except the claimed limitation "wherein the orthogonally-encoded mappings for distinct portions of the tree oriented data representation are in accordance with respective tables". However, Brown teaches mapping node 130^23 in master lookup table 200a and mapping node 130^4 in slave lookup table 200b (col. 14, lines 25-50).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of mapping node 130^23 in master lookup table 200a and mapping node 130^4 in slave lookup table 200b to Jeyaraman's system in order to search/retrieve deep levels of a tree.

As to claim 22, Jeyaraman discloses the claimed limitation in claim 18, except the claimed limitation "wherein the orthogonally-encoded mappings for multiple levels of the tree oriented data representation are in accordance with a single corresponding hash table". However, Brown teaches that lookup table 100 includes mapper level_1 112a and 112b. Mapper level_1 112a includes the first 16 of 32 levels of the binary tree. Mapper level_2 112b includes the next 8 levels of the 32-level binary tree (col. 5, lines 30-65).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of mapping tree levels to lookup table levels to Jeyaraman's system in order to allow multiple sparse subtree descriptors to be stored in a subtree entry in a memory.

As to claim 23, Jeyaraman discloses the claimed limitation in claim 18, except the claimed limitation "wherein the orthogonally-encoded hashes for each level of the tree-oriented data representation are in accordance with a single corresponding table". However, Brown teaches that lookup table 100 includes mapper level_1 112a and 112b. Mapper level_1 112a includes the first 16 of 32 levels of the binary tree. Mapper level_2 112b includes the next 8 levels of the 32-level binary tree . Each nodes includes string bits (col. 5, lines 30-65; col. 9, lines 25-60).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of mapping tree levels to lookup table levels to Jeyaraman's system in order to allow multiple sparse subtree descriptors to be stored in a subtree entry in memory in order.

As to claim 24, Jeyaraman teaches the claimed limitation "at least at any particular level of the tree-oriented data representation, the identifiers are orthogonally-encoded" as (col. 11, lines 35-45).

As to claim 26, Jeyaraman teaches the claimed limitation "employed in a duplicate elimination operation on the tree-oriented data representation" as (col. 9, lines 20-25).

As to claim 27, Jeyaraman teaches the claimed limitation "employed in a duplicate identification operation on the tree-oriented data representation" as (col. 9, lines 40-50).

As to claim 28, Jeyaraman teaches the claimed limitation "employed in an equality test operation on portions of the tree-oriented data representation" as (col. 11, lines 35-47).

As to claim 25, Aggarwal teaches the claimed limitation "wherein the combining function includes addition" as collapsing nodes A and B to create a node AB. This information implies that the system has included a combining function includes addition (col. 7, lines 65-66).

Aggarwal does not explicilty teach the claimed limitation "wherein the identifiers correspond to orthogonal binary encodings of integers". However, Brown teaches that the route index 102 for level-5 nodes 130^9-130^12 is r1, thus locations 140^9, 140^10 at addresses 01000 and 01001 in the L1 mapper 106a store r1 (col. 6, lines48-50).

It would have been obvious to a person of an ordinary skill in the skill in the art at the time the invention was made to apply Brown's teaching of that the route index 102

for level-5 nodes 130^9-130^12 is r1, thus locations 140^9, 140^10 at addresses 01000 and 01001 in the L1 mapper 106a store r1 to Jeyaraman's system in order to store nodes in memory efficiently.

8. Claims 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeyaraman in view of Benson (US 5940833).

As to claim 29, Jeyaraman teaches the claimed limitations:

"representing any given node of the hierarchically-organized data as a concatenation of node-specific information with a combination of the orthogonal values for each collapsed sub-hierarchy therebeneath" as (col. 7, lines 50-66; col. 8, lines 1-10).

"recursively collapsing sub-hierarchies thereof using encodings that, at least at a same level thereof; includes orthogonal values" as if a parent node in old_t does not have all of the same children in new_t, the system generates a node split operation for the parent, splitting the parent node into a first parent and a second parent at step 510. The first parent inherits all of the children that are present in new_t, and the second parent inherits the remaining children. It a parent node in old_t has all of the same children and additional children in new_t, the system generates a node collapse operation to bring all the children together in new_t at step 512. Additionally, if all of the children of a first parent in old_t move to a second parent in new_t, the system generates a node collapse operation to collapse the first parent into the second parent so that all of the children of the first parent are inherited by the second parent. The

system repeats these steps for ascending levels of the tree. The above information shows that the system recursively collapses sub-tree using new_ts not using encodings t Parent children in old_t is represented as orthogonal values (col. 7, lines 50-66; col. 8, lines 1-10).

Jeyaraman does not explicitly teach the claimed limitation "using encodings". Benson teaches encodeForest is also called recursively by EncodeTree to encode the child forest under a parent tree node (step 408 in FIG. 9).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Benson's teaching of encodeForest is also called recursively by EncodeTree to encode the child forest under a parent tree node To Jeyaraman's system in order to save memory space for storing information.

As to claim 30, Jeyaraman teaches the claimed limitation "transforming from a first encoding of the hierarchically-organized data to a collapsed second form" as (col. 7, lines 65-67; col. 8, lines 1-10).

As to claim 31, Jeyaraman teaches the claimed limitation "employed to eliminate duplicate sub-hierarchies in the hierarchically organized data" as (figs.6A-6B).

As to claim 32, Jeyaraman teaches the claimed limitation "employed to collapse duplicate sub-hierarchies in the hierarchically-organized data, wherein the

concatenation further includes a count of duplicate sub-hierarchies collapsed beneath any given node" as (col. 7, lines 40-65; col. 12, lines 25-35).

9. Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeyaraman in view of Aggarwal and Brown.

"As to claim 33, Jeyaraman teaches the claimed limitations:

"a program sequence including a recursively called set of instructions executable by one or more processors to operate on at least one instance of an hierarchically-organized data structure, the instructions" as if a parent node in old_t does not have all of the same children in new_t, the system generates a node split operation for the parent, splitting the parent node into a first parent and a second parent at step 510. The first parent inherits all of the children that are present in new_t, and the second parent inherits the remaining children. It a parent node in old_t has all of the same children and additional children in new_t, the system generates a node collapse operation to bring all the children together in new_t at step 512. Additionally, if all of the children of a first parent in old_t move to a second parent in new_t, the system generates a node collapse operation to collapse the first parent into the second parent so that all of the children of the first parent are inherited by the second parent. The system repeats these steps for ascending levels of the tree. The above information shows that the system recursively collapses sub-tree using new_ts. Parent children in old_t is represented as orthogonal values (col. 7, lines 50-66; col. 8, lines 1-10),

"when executed, causing the processor to define a counterpart data structure by collapsing plural nodes of the hierarchically-organized data structure into respective representations that each incorporate information of a respective node and that of any child nodes thereof" as (fig. 1, col. 5, lines 55-67),

"wherein values thereof provide the orthogonal encodings and keys thereof combine the information of respective nodes with an aggregation of the collapsed representations for child nodes thereof" as (col. 8, lines 15-25; col. 7, lines 50-67).

Jeyaraman fails to teach the claimed limitation "wherein the collapsing includes an order-insensitive aggregation of orthogonal encodings of information of the respective child nodes and an object implementing the counterpart data structure including at least one table". Aggarwal teaches collapsing nodes A and B to create nodes AB, collapsing nodes AB and C to create node ABC and collapsing nodes D and F to create node DF. The collapsing of these nodes does not following order from left node to right node. Thus, the collapsing of these nodes is order-insensitive (fig. 7, col. 8, lines 20-35). Brown teaches a binary tree representation of the entries stored in the mappers 106a-c in the lookup table 100 (col. 5, lines 45-47).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Aggarwal's teaching of collapsing nodes A and B to create nodes AB, collapsing nodes AB and C to create node ABC and collapsing nodes D and F to create node DF. The collapsing of these nodes does not following order from left node to right node and Brown's teaching of a binary tree representation of the entries stored in the mappers 106a-c in the lookup table 100 to Jeyaraman's system in

order to reduce number search depth levels of a tree during matching nodes and combining nodes in trees..

As to claim 34, Jeyaraman teaches the claimed limitation "wherein the at least one computer readable medium is selected from the set of a disk, tape or other magnetic, optical, or electronic storage medium and a network, wire line, wireless or other communications medium" as (col. 2, lines 60-67).

10. Claims 35-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aggarwal in view Brown.

As to claim 35, Aggarwal teaches the claimed limitations:

"an encoding of a hierarchically-organized data structure instantiable in memory addressale by the one or more processors" as a tree instantiable in a memory by a processor (col. 4, lines 48-50; col. 7, lines 35-50). This tree is not an encoding tree;

"instructions executable by the one or more processors to operate on at least one instance of the hierarchically-organized data structure instantiated in memory, the instructions, when executed, causing the processor to define a counterpart data structure in the memory by collapsing plural nodes of the hierarchically-organized data structure into respective representations that each incorporate information of a respective node and that of any child nodes thereof, wherein the collapsing includes an order-insensitive aggregation of orthogonal encodings of information of the respective child nodes" as collapsing nodes A and B to create nodes AB, collapsing nodes AB and

C to create node ABC and collapsing nodes D and F to create node DF. The collapsing of these nodes does not following order from left node to right node. Thus, the collapsing of these nodes is order-insensitive . The collapsing of these nodes includes order insensitive aggregation of information of nodes. This information is not encoded information (fig. 7, col. 8, lines 20-35).

Aggarwal does not explicitly teach the claimed limitation "an encoding and orthogonal encodings". Brown teaches values for multiple subtree leaves are encoded in the node descriptor (col.3, lines 45-50).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Brown's teaching of values for multiple subtree leaves are encoded in the node descriptor to Aggarwal's system in order to reduce the number of searches requied if there are no entries down a leaf of a tree.

As to claim 36, Aggarwal discloses the claimed limitation subject matter in claim 35, except the claimed limitation "matching instructions executable by the one or more processors to identify distinct sub-hierarchies of the hierarchically-organized data structure as at least equivalent based on correspondence of the collapsed representations". Jeyaraman teaches Jeyaraman teaches that the system first matches leaf nodes of old_t (old tree) and new_t (new tree). If a parent node in old_t has all of the same children and additional children in new_T, the system generates a node collapse operation to bring all the children together in new_t. All nodes include value identifiers. The above information shows that when system matches nodes from trees,

the system has to match their identifiers too. Thus, when system brings all the matched children together from old_tree to new_t, the system ensures that same combinations of child node identifiers result in same child nodes in new_t without ordering of the child node identifiers (col. 7, lines 40-65; col. 8, lines 15-25).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Jeyaraman's teaching of bringing together old_t matched nodes with new_t nodes to new_t and all nodes contain value identifiers to Aggarwal's system in order to save memory space, eliminate redundant node, and to transform a old tree to new tree efficiently.

11. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aggarwal in view Brown and further in view of Jeyaraman.

As to claim 37, Aggarwal does not explicitly teach the claimed limitation "matching instructions executable by the one or more processors to identify at least equivalent portions of first and second ones of the hierarchically organized data structure based on correspondence of collapsed representations thereof". Jeyaraman teaches Jeyaraman teaches that the system first matches leaf nodes of old_t (old tree) and new_t (new tree). If a parent node in old_t has all of the same children and additional children in new_T, the system generates a node collapse operation to bring all the children together in new_t. All nodes include value identifiers. The above information shows that when system matches nodes from trees, the system has to match their identifiers too. Thus, when system brings all the matched children together

from old_tree to new_t, the system ensures that same combinations of child node identifiers result in same child nodes in new_t without ordering of the child node identifiers (col. 7, lines 40-65; col. 8, lines 15-25).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Jeyaraman's teaching of bringing together old_t matched nodes with new_t nodes to new_t and all nodes contain value identifiers to Aggarwal's system in order to save memory space, eliminate redundant node, and to transform a old tree to new tree efficiently.

12. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aggarwal in view Brown and further in view of Marquis (US 6427147).

As to claim 38, Aggarwal does not explicitly teach the claimed limitation "wherein the order insensitive aggregation is performed recursively at successive levels of a collapsed sub-hierarchy". Marquis teaches the branch delete process recursively examines nodes until a subtree containing the requested LID is found, whereupon the branch delete process call the leaf delete process. Once the leaf delete process is performed the branch delete process collapses the data tree structure as required (col. 17, lines 1-6).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Marquis's teaching of the branch delete process recursively examines nodes until a subtree containing the requested LID is found, whereupon the branch delete process call the leaf delete process. Once the leaf delete

process is performed the branch delete process collapses the data tree structure as required to Aggarwal's system in order to save cost and time collapsing nodes on a hierarchy structure.

13. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jeyaraman (US 6311187) in view of Benson (US 5940833).

As to claim 41, Jeyaraman teaches the claimed limitations:

"a processor and memory addressable thereby" as (col. 2, lines 60-65);

"means for performing an element order independent comparison of hierarcially organized data structure using a transformation operation" as as if a parent node in old_t does not have all of the same children in new_t, the system generates a node split operation for the parent, splitting the parent node into a first parent and a second parent at step 510. The first parent inherits all of the children that are present in new_t, and the second parent inherits the remaining children. It a parent node in old_t has all of the same children and additional children in new_t, the system generates a node collapse operation to bring all the children together in new_t at step 512. Additionally, if all of the children of a first parent in old_t move to a second parent in new_t, the system generates a node collapse operation to collapse the first parent into the second parent so that all of the children of the first parent are inherited by the second parent. The system repeats these steps for ascending levels of the tree (col. 7, lines 50-66; col. 8, lines 1-10).

Jeyaraman does not explicitly teach the claimed limitation "that orthogonally and recursively encodes childe node information". Benson teaches encodeForest is also called recursively by EncodeTree to encode the child forest under a parent tree node (step 408 in FIG. 9).

It would have been obvious to a person of an ordinary skill in the art at the time the invention was made to apply Benson's teaching of encodeForest is also called recursively by EncodeTree to encode the child forest under a parent tree node To Jeyaraman's system in order to save memory space for storing information.

Allowable Subject Matter

14. Claims 8-11, 3-4, 18-28, 16 and 39-40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to claim 8, none of the available prior art of record teaches or fairly suggest an "arithmetic addition of orthogonal binary encodings that identify corresponding table entries for respective child nodes; and concatenation of a result of the arithmetic addition with an encoding of information for the particular node".

As to claim 3, none of the available prior art of record teaches or fairly suggest "wherein a unit of orthogonally-encoded child node information includes a power-of-two encoded mapping of a concatenation of the child node information with a similarly encoded mapping of respective information of child nodes thereof".

As to claim 4, none of the available prior art of record teaches or fairly suggest "wherein a unit of orthogonally-encoded child node information includes a power-of-two encoded mapping of a concatenation of the child node information with recursively encoded mappings of respective sub-hierarchies thereof".

As to claim 39, none of the available prior art of record teaches or fairly suggest" at least one hash table; and a recursively encoded mapping wherein for any particular node of the hierarchically-organized data structure, a corresponding table entry econdes both respective values for child nodes thereof in accordance with the order-insensitive information and aggregation associated with the particular node itself, and wherein, at least for same-level nodes of the hierarchically-organized data structure, corresponding values are orthogonal".

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure

White et al (US 6618733).

Contact Information

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cam Y T Truong whose telephone number is (571) 272-4042. The examiner can normally be reached on Monday to Firday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Breene can be reached on (571) 272-4107. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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6/20/2005

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